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INTRASPECIFIC VARIABILITY OF PHOTOSYNTHETIC TRAITS OF *PINUS PONDEROSA* SUBJECTED TO LONG-TERM EXPOSURE TO ELEVATED CO_2

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It has been projected that the atmospheric concentration of CO_2 will double in the next century. This increase in ambient CO_2 will have substantial impact on forest ecosystems. However, the database on the long-term effects of elevated CO_2 on forest species is limited. Also, the extent of intraspecific variability in the response to elevated CO_2 remains largely unknown. We are investigating the effects of elevated CO_2 on the intraspecific variability of photosynthesis, quantum yield (as measured though chlorophyll fluorescence Fv/Fm ratio) and pigmentation in *Pinus ponderosa.* We obtained four-year-old *Pinus ponderosa* seedlings from nine different sources (either half-sibling or open-pollinated) across California. These seedlings were then grown in standard 3m x 3m cylindrical outdoor exposure chambers for 16 months at either ambient levels of CO_2, ambient+175ppm CO_2, or ambient+350ppm CO_2. The seedlings were then measured for photosynthesis, chlorophyll fluorescence, and pigmentation. Chlorophyll fluorescence was measured using a Morgan CF1000 to determine Fv/Fm. Photosynthesis was measured with a LICOR 6200. Pigments were extracted using dimethylformamide (DMF). While the results show an increase in photosynthesis with increasing CO_2, both pigmentation and Fv/Fm decreased with increasing CO_2. The results show a wide variability in response for all traits measured. Photosynthesis measured in the nine sources of seedlings ranged from 1.7 to 3.1 mol m^{-2} s^{-1} at ambient levels of CO_2 and ranged from 3.7 to 6.5 mol m^{-2} s^{-1} at ambient + 350ppm CO_2. The range in chlorophyll a was 11.5 to 15.0 g cm^{-2} at ambient levels of CO_2 and ranged from 8.7 to 13.2 g cm^{-2} at ambient + 350ppm CO_2. Quantum yield (Fv/Fm) response also showed a wide range of response with Fv/Fm ratios ranging from 0.72 to 0.78 at ambient levels of CO_2, and ranged from 0.73 to 0.77 at ambient + 350ppm CO_2. The source of *P. ponderosa* that had the greatest increase in photosynthesis (a source from the California Coast) had the least reduction in quantum yield (maintained Fv/Fm) and chlorophyll in the presence of elevated CO_2. This research was performed under the auspices of the U.S. Department of Energy at LLNL under contract W-7405-Eng-48.